Low-Cost Innovative Hi-Temp Fiber Coating Process for Advanced Ceramic Matrix Composites, Phase I

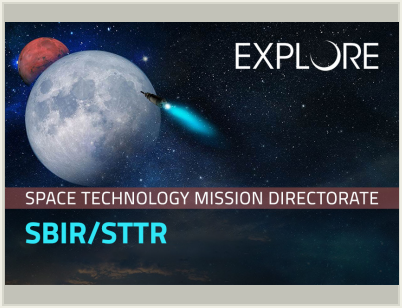
Completed Technology Project (2009 - 2009)

Project Introduction

MATECH GSM (MG) proposes 1) to demonstrate a low-cost innovative Hi-Temp Si-doped in-situ BN fiber coating process for advanced ceramic matrix composites in order to eliminate performance barriers that prevent practical use of advanced future NASA aircraft by performing interfacial coating on single fiber tows and fiber preforms that are applicable to the shape and structural requirements of advanced SiC/SiC super- and hyper-sonic components, and 2) to examine and model environmental durability of the fiber coating constituent in various hot-section CMC components. The CVI coating process is costly and yields a porous non-uniform BN structure due to the low temperatures needed for diffusion and infiltration of the gaseous precursors. MG has discovered a faster, more economical and more versatile process for fiber interface coating formation, reactive-transformation-process (RTP), where the interface coating is formed from the ceramic fiber itself, a new innovative in-situ Si-doped BN-based fiber coating that is more stable during fabrication and service of Si-based CMC. The formation of an in-situ BN surface layer creates a more environmentally durable fiber surface not only because a more oxidation-resistant BN is formed, but also because this layer provides a physical barrier between contacting all single fibers with oxidation-prone SiC surface layers.

Anticipated Benefits

A wide rage of aerospace and defense applications that require low-cost material possessing, high temperature oxidation stability, high temperature moisture resistance, high strength, and low mass. These applications include many propulsion and power generating components with the advanced CMC such as hot gas generators, hot gas valves and components, and heat exchangers. Non-defense related uses include industrial high-temperature heat-treatment damage-tolerant furnace heating-element and insulation materials.



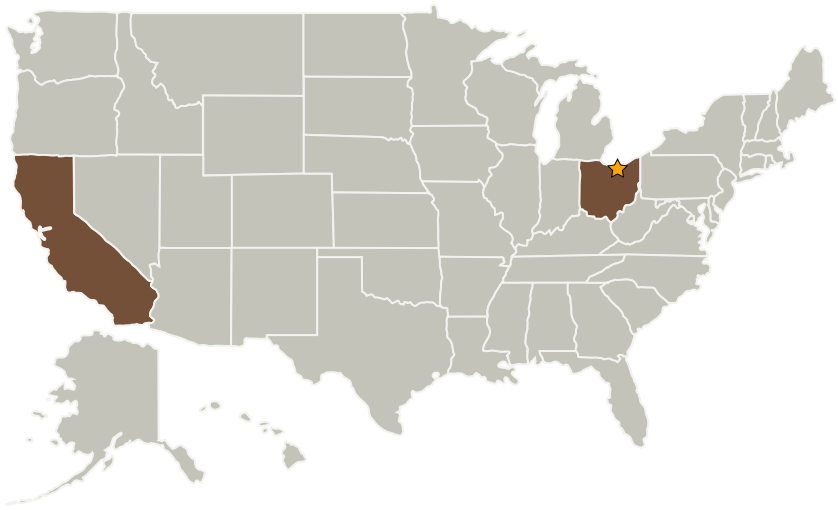
Low-Cost Innovative Hi-Temp Fiber Coating Process for Advanced Ceramic Matrix Composites, Phase I

Table of Contents

Low-Cost Innovative Hi-Temp Fiber Coating Process for Advanced Ceramic Matrix Composites, Phase I

Completed Technology Project (2009 - 2009)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
MATECH Advanced Materials	Supporting Organization	Industry	Westlake Village, California

Primary U.S. Work Locations	
California	Ohio

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

James A Dicarlo

Principal Investigator:

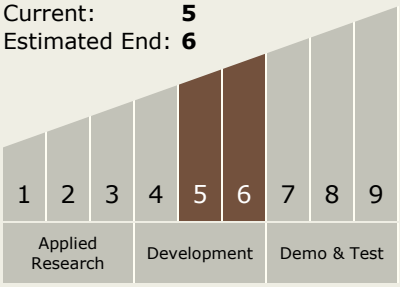
Heemann Yun

Low-Cost Innovative Hi-Temp Fiber Coating Process for Advanced Ceramic Matrix Composites, Phase I

Completed Technology Project (2009 - 2009)

Technology Maturity (TRL)

Start: **5**
Current: **5**
Estimated End: **6**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.1 Manufacturing Processes